GUIDING TRANSITION-METAL CATALYST SELECTIVITY USING PROTEINS

Amanda Jarvis, School of Chemistry, Joseph Black Building, Kings Buildings, University of Edinburgh, USA
amanda.jarvis@ed.ac.uk

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Artificial metalloenzymes aim to combine the benefits of natural enzymes (selectivity, rate enhancement) with the scope of reactions provided by traditional transition metal chemistry (both reactions inspired by nature e.g. oxidations and reactions never seen in nature i.e. Pd cross-coupling reactions).[1] Proteins containing apolar cavities and tunnels have been utilized as scaffolds in which transition metal complexes can be introduced to build up catalysts that provide linear selectivities and improve substrate turnover through enhancing substrate binding.[2, 3] A number of different methods can be utilized to introduce the metal complex into the protein scaffold, including either introducing reactive amino acids (e.g. cysteine's) which can subsequently be modified with a metal binding ligand, or directly introducing metal binding unnatural amino acids such as bipyridylalanine using amber stop codon suppression methodology.[4] In this talk, I will cover our work towards developing artificial metalloenzymes using these methods for a range of synthetic challenges from the biphasic linear selective hydroformylation of alkenes to selective C-H functionalization.

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